ZooKeys 313: 81–90 (2013)
doi: 10.3897/zookeys.313.5460
www.zookeys.org

RESEARCH ARTICLE

A peer-reviewed open-access journal
ZooKeys
Launched to accelerate biodiversity research

Two new species in the subfamily Perlinae (Plecoptera, Perlidae) from China

Wang Hong–Liang[1,†], Wang Guo–Quan[2,‡], Li Wei–Hai[1,§]

1 *Department of Plant Protection, Henan Institute of Science and Technology, Xinxiang, Henan 453003, China* **2** *Department of Plant Protection, Guangxi University, Nanning, Guangxi 530004, China*

† *urn:lsid:zoobank.org:author:C7EF202E-096B-4E9B-9B78-E7EEA6AA90ED*
‡ *urn:lsid:zoobank.org:author:351B5BB1-A386-43D3-AE8D-4A273CA7BA4D*
§ *urn:lsid:zoobank.org:author:81D57DE5-E00B-4F6B-A0B3-E81D3C865208*

Corresponding author: *Li Wei–Hai* (lwh7969@163.com)

Academic editor: *Sam Heads* | Received 4 May 2013 | Accepted 27 June 2013 | Published 2 July 2013

urn:lsid:zoobank.org:pub:20982C05-0FC3-45FD-9BF6-E30958669103

Citation: Wang H–L, Wang G–Q, Li W–H (2013) Two new species in the subfamily Perlinae (Plecoptera, Perlidae) from China. ZooKeys 313: 81–90. doi: 10.3897/zookeys.313.5460

Abstract

Two species in the genera *Neoperla* and *Kamimuria* (Plecoptera: Perlidae) from China are described as new: *Kamimuria guangxia* **sp. n.**, and *Neoperla mesostyla* **sp. n.** The new species are compared to similar taxa.

Keywords

Plecoptera, Perlidae, *Neoperla*, *Kamimuria*, new species, China

Introduction

Kamimuria and *Neoperla* (Plecoptera: Perlidae) are the most speciose genera within the subfamily Perlinae within China (Du et al. 1999, DeWalt et al. 2013). *Neoperla* is represented by more than 70 known species in China, comprising about 30% of species in the genus (DeWalt et al. 2013). These were described by Chu (1929), Du

Copyright *Wang Hong–Liang et al.* This is an open access article distributed under the terms of the Creative Commons Attribution License 3.0 (CC-BY), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

(1999, 2000 a, b), Du and Sivec (2004, 2005), Du and Wang (2005, 2007), Du et al. (2001), Sivec and Zwick (1987), Wu (1935, 1938, 1948, 1962, 1973), Wu and Claassen (1934), Yang and Yang (1990, 1991), Yang and Yang (1992, 1993, 1995 a, b, 1996, 1998), Li et al. (2011), Li and Wang (2011), Li et al. (2012), Li et al. (2012), Li and Li (2013) and Li et al. (2013). *Kamimuria* is represented by nearly 50 species in China, comprising about 70% of the described species within the genus (DeWalt et al. 2013; Sun and Du 2012; Li et al. 2012). In the present paper, we describe two additional Perlinae species as new to science: *Kamimuria guangxia* sp. n., and *Neoperla mesostyla* sp. n. from the Guangxi autonomous region. These species seem most closely related to congeners known from other southeastern Asian areas, as noted in the text. All types, including paratypes, are deposited in the Entomological Museum of China Agricultural University (CAU). Aedeagi were everted using the cold maceration technique of Zwick (1983) or Sivec et al. (1988).

Taxonomy

***Kamimuria guangxia* Li & Wang, sp. n.**
urn:lsid:zoobank.org:act:5BF4961D-1520-418F-B086-F6F168097A51
http://species-id.net/wiki/Kamimuria_guangxia
Figs 1–3

Type material. Holotype: male, originally labeled as China: Guangxi autonomous region, Tian'e County, Buliuhe River, light trap, 25.0005 N, 107.1738 E, 16 Aug. 2002, Ding Yang. Paratypes: 2 males, same data as holotype.

Male. Forewing length 14.8–15.0 mm. General body color dark brown. Head slightly wider than pronotum, generally brown with darker, quadrate interocellar region, the anterior corners of which extend laterally in teneral specimen, M-line pale (Figs 1A-B); compound eyes dark; antennae dark brown. Pronotum dark brown with rugose surface (Fig. 1A); wing membrane brown, veins darker; femora pale basally, otherwise dark (Fig. 1E).

Terminalia. Hemiterga slender, finger-like, and slightly swollen apically, without hidden groove (Figs 2A–B). Tergum 9 with posteromedial patch of sensilla basiconical on a somewhater darker sclerite. Tergum 8 without sensilla patch. (Figs 1C, 2A). Setal brushes present on sterna 4–6. Aedeagus before eversion oval, apex tapering, hidden sac with apex darker and palm-like, with two lateral sharp claws and a median pad (Fig. 2C). Aedeagal sac membranous, medially constricted, apex expanded, heart-shaped and mostly covered with fine spinules, the apex and basal half of the sac bare (Fig. 3).

Female. Unknown.

Etymology. The specific epithet refers to Guangxi autonomous region where the type specimen was collected.

Distribution. China (Guangxi).

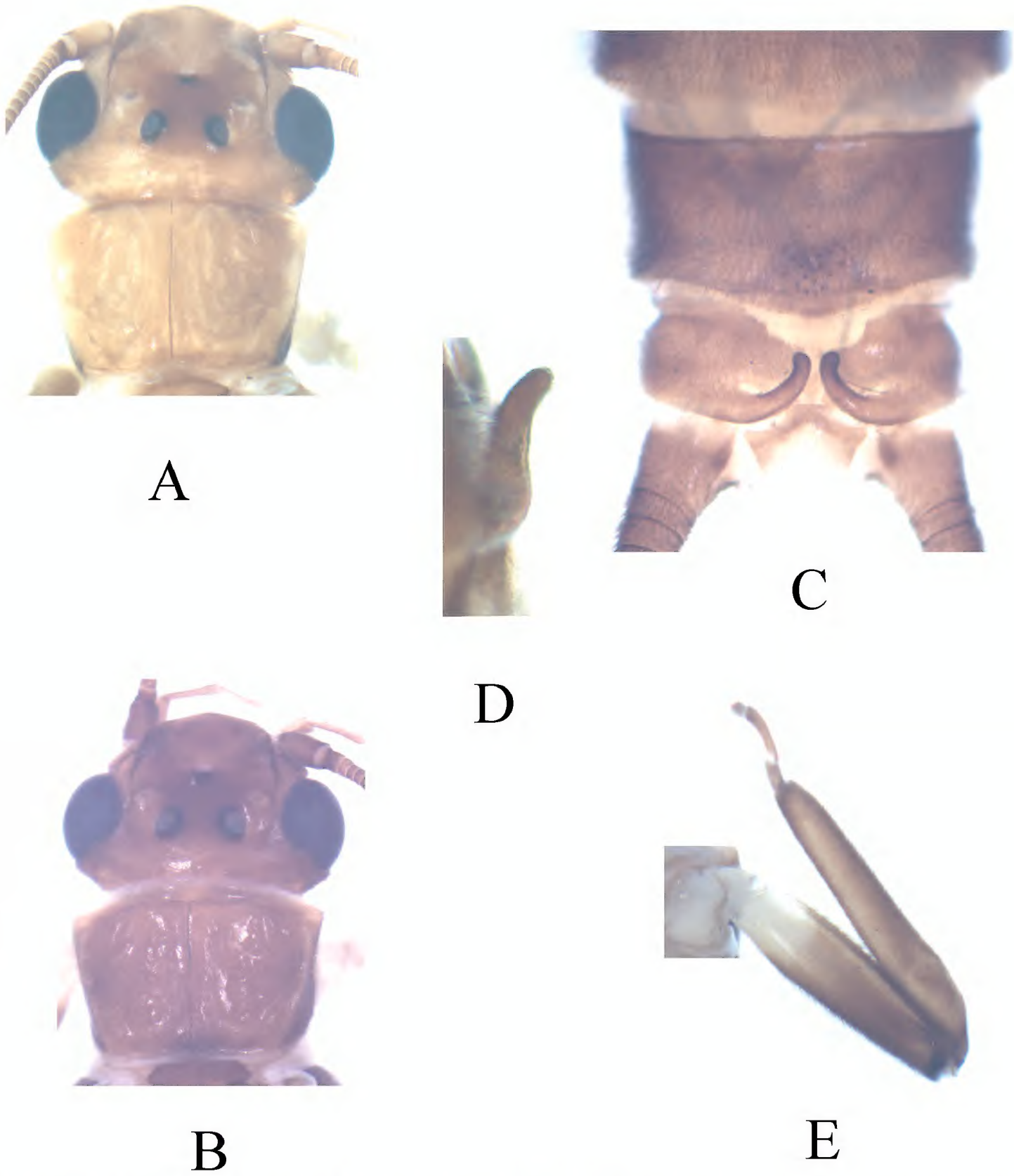

Figure 1. *Kamimuria guangxia* Li & Wang, sp. n. (male). **A** Head and pronotum, dorsal view (teneral specimen) **B** Head and pronotum, dorsal view (older specimen) **C** Terminalia, dorsal view **D** Hemitergal process, lateral view **E** Foreleg, lateral view.

Diagnosis. The male of *K. guangxia* is characterized by the hemiterga being slightly swollen apically. The aedeagal sac is membranous, medially constricted, apex expanded, heart-shaped and mostly covered with fine to tiny spines (Figs 1C, 2B). The new species is similar to *K. atra* Sivec & Stark, 2008, a species known both from Vietnam and Thailand, in general body color and features of terminalia, but tergum 8 of the new species has no sensilla basiconica patch.

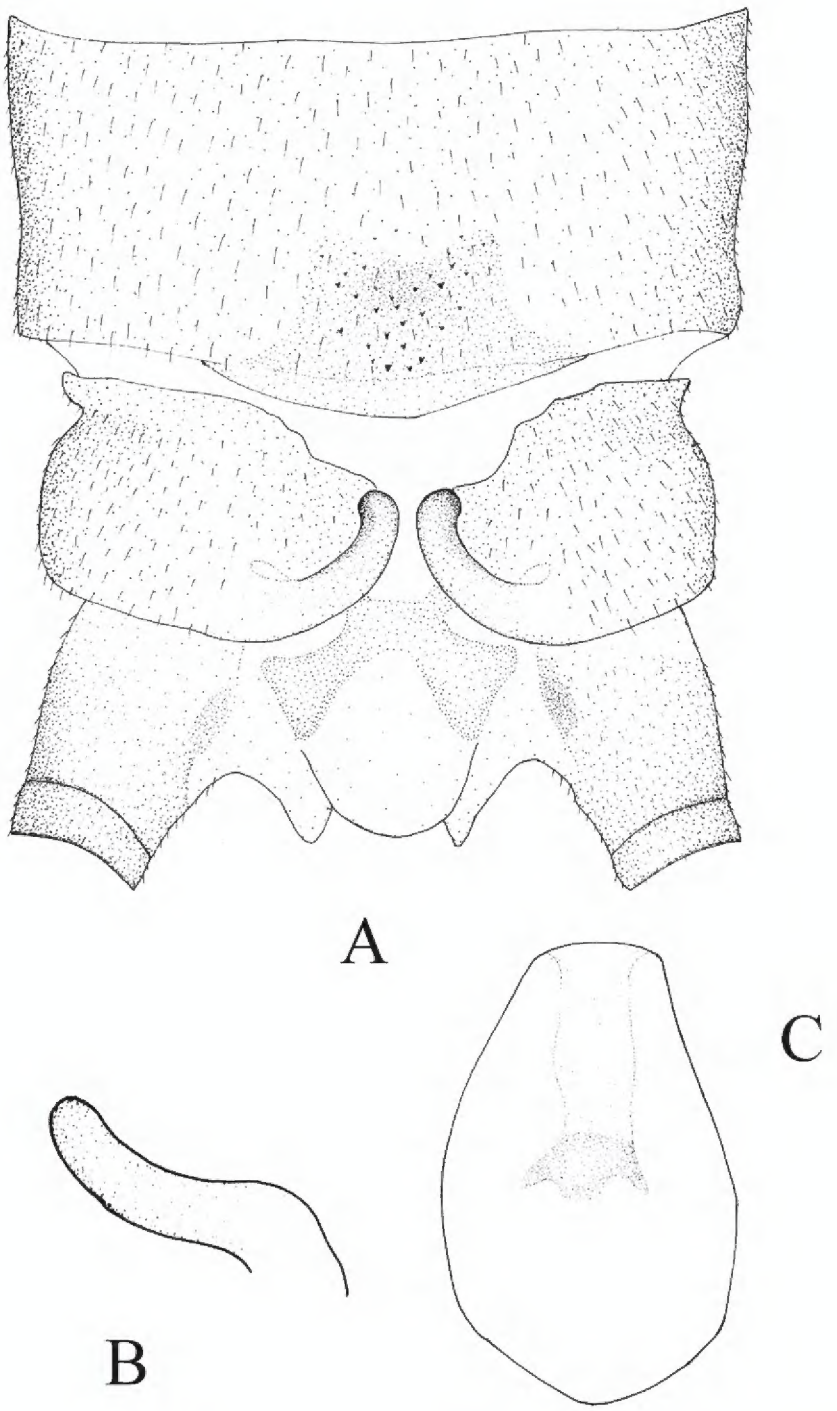

Figure 2. *Kamimuria guangxia* Li & Wang, sp. n. (male). **A** Terminalia, dorsal view **B** Hemitergal process, lateral view **C** Aedeagus before eversion, ventral view.

Neoperla mesostyla **Li & Wang, sp. n.**
urn:lsid:zoobank.org:act:151A4084-8B37-424B-BD9A-8F8CB4A5857A
http://species-id.net/wiki/Neoperla_mesostyla
Figs 4–5

Type material. Holotype: male, China: Guangxi autonomous region, Mt. Jiuwanshan, Jiuren Station next to Rongjiang River, 950–1150 m, 25.0673 N, 109.2563 E, light trap, 3 Aug. 2003, Zhang Li-Li. Paratype: 1 male, same data as holotype.

Male. Forewing length ca. 14.8 mm. General body color brown. Distance between ocelli nearly as wide as diameter of ocellus. Head slightly wider than pronotum, with a small triangular interocellar patch and another black triangular patch on frons (Fig. 4A); compound eyes dark; antennae dark brown. Pronotum pale brown with darker

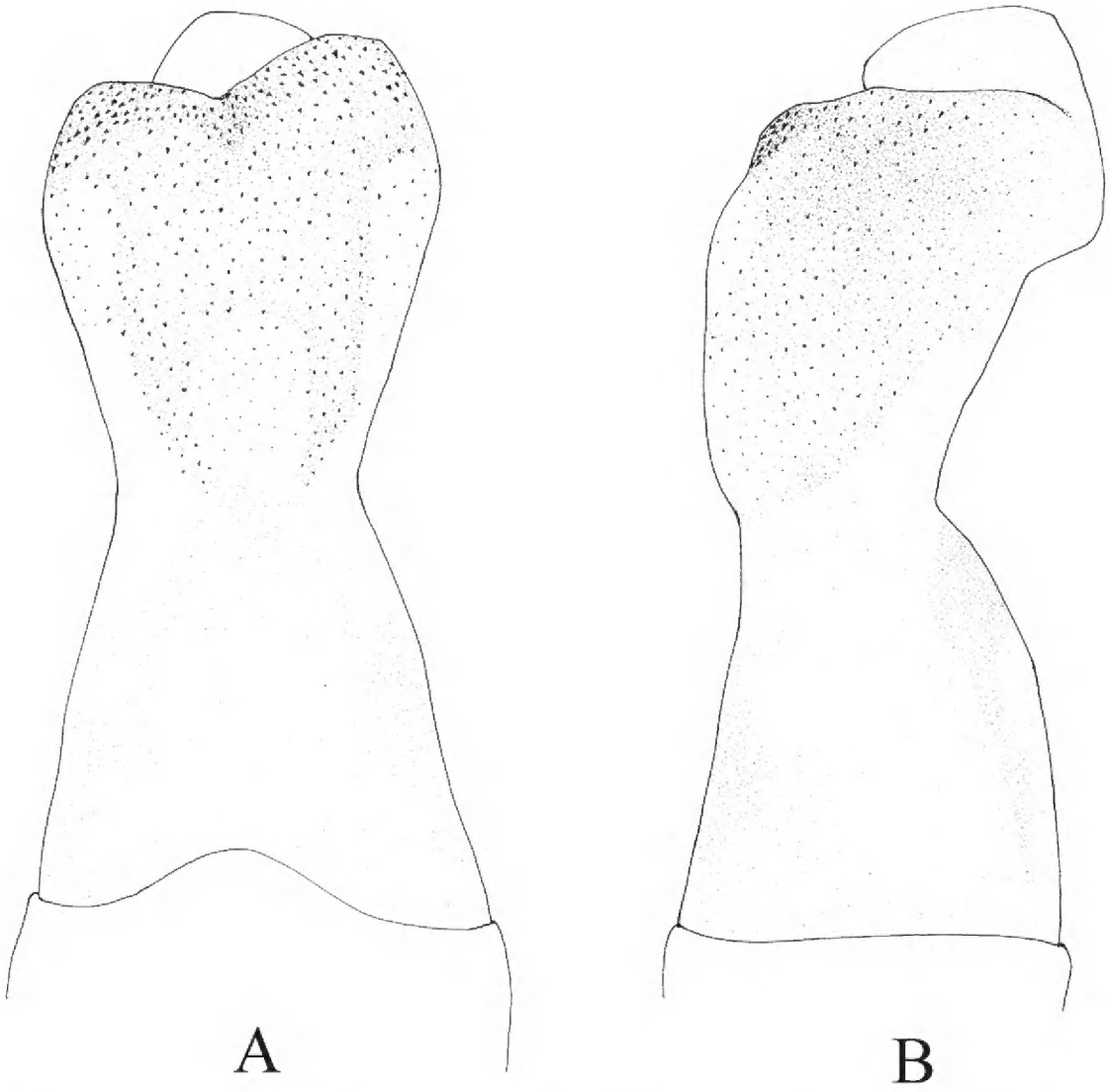

Figure 3. *Kamimuria guangxia* Li & Wang, sp. n. (male). **A** Aedeagus, dorsal view **B** Aedeagus, lateral view.

anterior and median stripes (Fig. 4A); wing membrane pale brown, veins dark; legs yellowish brown, distal fourth of femora, basal fifth of tibiae and tarsi darker (Fig. 4C).

Terminalia. Process of tergum 7 forming a large subquadrate plateau, mostly covered with dense sensilla basiconica patches but with few sensilla basiconica at margins (Fig. 4B). Tergum 8 with an upcurved tongue-shaped process, with sparse ventral tiny spines. Tergum 9 without sensilla basiconica patches. Hemitergal lobes slender and curved laterally near midlength (Fig. 4B). Aedeagal tube plump (length 3× width at basal bulb), ventrally with a mesal bifurcate lobe bearing a basal common stem, dorsal surface heavily sclerotized, the pigmentation slightly expanded mesolaterally, membranous sac 1.5× as long as tube and gradually curved ventrad to form a loop; sharp to stout small spines occur along dorsal surface toward apex (Figs 4D, E, 5).

Zwick & Sivec defined the bulb side of the tube as being ventral, however, the sac of the new species forms a loop so that the spines of apical half of the dorsal surface are actually ventrally directed; we herein discuss dorsal or ventral surfaces of the sac as if it were straight, as such in *Neoperla flagellata* Li & Murányi (Li et al. 2012) and *N. monacha* Stark & Sivec (Stark and Sivec 2008).

Female. Unknown.

Etymology. The specific epithet refers to the mesal position of the bifurcate lobe on the ventral surface of the aedeagal tube.

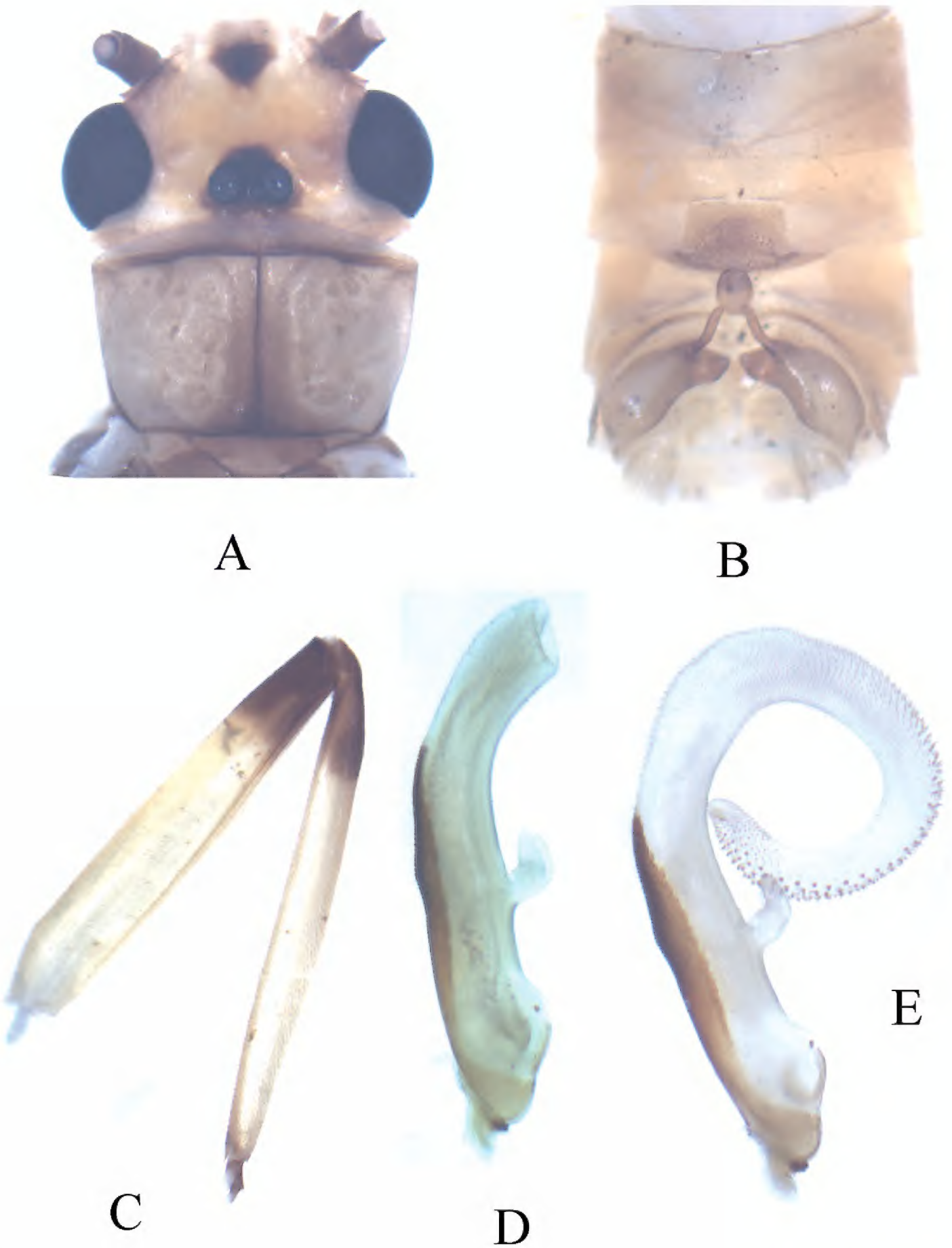

Figure 4. *Neoperla mesostyla* Li & Wang, sp. n. (male). **A** Head and pronotum, dorsal view **B** Terminalia, dorsal view **C** Hindleg (part of tarsi in this leg missing), lateral view **D** Aedeagus before eversion, lateral view **E** Aedeagus, lateral view.

Distribution. China (Guangxi).

Diagnosis. The new species appears to belong to a well differentiated subgroup of the montivaga species group (Zwick 1983) that has as tube characteristics a dark,

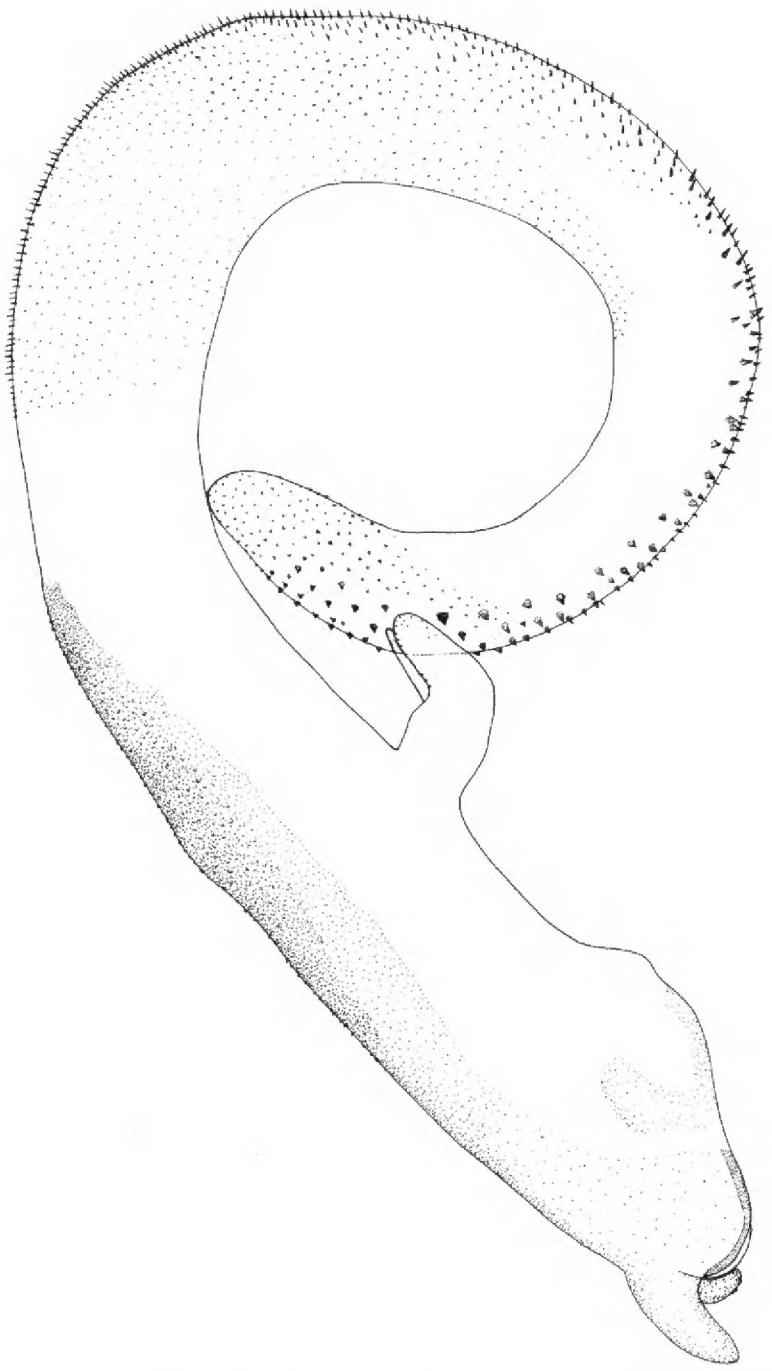

Figure 5. *Neoperla mesostyla* Li & Wang, sp. n. Male aedeagus, lateral view.

elongate sclerite dorsally and a bilobed, mostly membranous process ventrally (Zwick and Sivec 1985). Based on these features, several other species could also be assigned to this *diehli* subgroup: *Neoperla han* Stark, *N. mnong* Stark, *N. furcostyla* Li & Qin, *N. forcipata* Yang and Yang & *N. yao* Stark.

The new species is characterized by the aedeagal tube being short (≤3× width of bulb) and the ventral, bifurcate process being midlength on the tube. Additionally, the apical half of the sac is clothed with heavy spinules on the dorsal surface. *Neoperla diehli* has an elongate slender aedeagal tube (length ≥4× tube width), the ventral processes originate at the apex of the tube, and the heavy spinules are restricted to the tip of the sac (see Fig. 21 in Zwick and Sivec 1985). *Neoperla mesostyla* is easily distinguishable from other members of the group by its very long sac and relatively short Y-lobe. *Neoperla han* Stark and *N. yao* Stark have elongate Y-lobes (Figs 6, 10 in Stark 1987); *N. mnong* Stark, *N. furcostyla* Li & Qin, and *N. forcipata* Yang & Yang have a short or very short aedeagal sac (Fig. 7 in Stark 1987; Figs 2 B, C in Li et al. 2013).

Acknowledgments

We acknowledge the partial support of our research by the National Natural Science Foundation of China (No. 31000977).

References

Chu Y-T (1929) Descriptions of four new species and one new genus of stone-flies in the family Perlidae from Hangchow. The China Journal 10: 88–92.

DeWalt RE, Neu-Becker U, Stueber G (2013) *Plecoptera Species File Online*. Version 5.0/5.0. 6/12/2013. http://Plecoptera.SpeciesFile.org

Du Y-Z (1999) Plecoptera. In: Huang BK (Ed) Fauna of Insects in Fujian Province of China. Vol. 3. Fujian Science and Technology Publishing house, Fuzhou, Fujian, China. 301–335.

Du Y-Z (2000a) *Neoperla magisterchoui*, a new species of the genus *Neoperla* Needham (Plecoptera: Perlidae) from China. In: Zhang YL (Ed) Systematic and faunistic research on Chinese insects. Proceedings of the 5th National Congress of Insect Taxonomy. China Agriculture Press. Beijing, 1–3.

Du Y-Z (2000b) Two new species of the genus *Neoperla* Needham (Plecoptera: Perlidae: Perlinae) from Guizhou, China. Entomotaxonomia 22: 1–5.

Du Y-Z, Sivec I (2004) Plecoptera: Perlidae, Nemouridae, Leuctridae. In: Yang XK (Ed) Insects from Mt. Shiwandashan area of Guangxi. China forestry Publishing House, Beijing, 39–45.

Du Y-Z, Sivec I (2005) Plecoptera. In: Yang XK (Ed) Insect Fauna of Middle-west Qinling Range and South Mountains of Gansu Province. Science Press, Beijing, 38–54.

Du Y-Z, Wang Z-J (2005) Plecoptera: Leuctridae, Nemouridae, Perlidae and Peltoperlidae. In: Yang MF, Jin DC (Eds) Insects from Dashahe Nature Reserve of Guizhou. Guizhou People Press, Guiyang, Guizhou, 51–57.

Du Y-Z, Wang Z-J (2007) Nemouridae and Perlidae. In: Li ZZ, Yang MF, Jin DC (Eds) Insects from Mountain Leigongshan Landscape of Guizhou. Guizhou Science and Technology Publishing house, Guiyang, Guizhou, 84–90.

Du YZ, Sivec I, He J-H (1999) A checklist of the Chinese species of the family Perlidae (Plecoptera: Perloidea). Acta Entomologica Slovenica 7: 59–67.

Du Y-Z, Sivec I, Zhao M-S (2001) Plecoptera. In: Wu H, Pan CW (Eds) Insects of Tianmushan National Nature Reserve. Science Press, Beijing, 69–80.

Li W-H, Li X-P (2013) A new species of the genus *Neoperla* (Plecoptera: Perlidae) from China. Acta Zootaxonomica Sinica 38: 75–77.

Li W-H, Wang R-F (2011) A new species of *Neoperla* (Plecoptera: Perlidae) from China. Entomological News 122: 261–264. doi: 10.3157/021.122.0308

Li W-H, Wang H-L, Lu W-Y (2011) Species of the genus *Neoperla* (Plecoptera: Perlidae) from Henan, China. Zootaxa 2735: 57–63.

Li W-H, Wang G-Q, Lu W-Y (2012) Species of *Neoperla* (Plecoptera: Perlidae) from Hubei, China. Zootaxa 3478: 32–37.

Li W-H, Wang G-Q, Li W-L, Murányi D (2012) Review of *Neoperla* (Plecoptera: Perlidae) from Guangdong Province of China. Zootaxa 3597: 15–24.

Li W-H, Wang G-Q, Qin X-F (2013) Two new species of *Neoperla* (Plecoptera: Perlidae) from China. ZooKeys 290: 21–30. doi: 10.3897/zookeys.290.4568

Li W-H, Wang L-H, Yu H (2012) First record of *Kamimuria* (Plecoptera: Perlidae) from Hainan Island of China, with description of *K. hainana* n. sp. Zootaxa 3500: 84–88.

Li W-H, Wu L-M, Zhang H-R (2011) A new species of the genus *Neoperla* (Plecoptera: Perlidae) from Henan, China. Acta Zootaxonomica Sinica 36: 33–35.

Sivec I, Zwick P (1987) Some *Neoperla* (Plecoptera) from Taiwan. Beiträge zur Entomologie 37: 391–405.

Sivec I, Stark BP (2008) New species of *Kamimuria* Klapálek (Plecoptera: Perlidae) from Thailand and Vietnam, with notes on Chinese species. Illiesia 4: 110–138.

Sivec I, Stark BP, Uchida S (1988) Synopsis of the world genera of Perlinae (Plecoptera: Perlidae). Scopolia 16: 1–66.

Stark BP (1987) Records and descriptions of Oriental Neoperlini (Plecoptera: Perlidae). Aquatic Insects 9: 45–50. doi: 10.1080/01650428709361270

Stark BP, Sivec I (2008) New species and records of *Neoperla* (Plecoptera: Perlidae) from Vietnam. Illiesia 4: 19–54.

Sun H-T, Du Y-Z (2012) Two new species of the genus *Kamimuria* (Plecoptera: Perlidae) from China, with redescription of *Kamimuria cheni* Wu and *Kamimuria chungnanshana* Wu. Zootaxa 3455: 61–68.

Wu C-F (1935) Aquatic insects of China. Article XXI. New species of stoneflies from East and South China. (Order Plecoptera). Peking Natural History Bulletin 9: 227–243.

Wu C-F (1938) Plecopterorum sinensium: A monograph of stoneflies of China (Order Plecoptera). Yenching University, 225 pp.

Wu C-F (1948) Fourth supplement to the stoneflies of China (Order Plecoptera). Peking Natural History Bulletin 17: 75–82.

Wu C-F (1962) Results of the Zoologico-Botanical expedition to Southwest China, 1955-1957 (Plecoptera). Acta Entomologica Sinica 11 (Supplement): 139–153.

Wu C-F (1973) New species of Chinese stoneflies (Order Plecoptera). Acta Entomologica Sinica 16: 97–118.

Wu C-F, Claassen PW (1934) Aquatic insects of China. Article XXI. New species of Chinese stoneflies. (Order Plecoptera). Peking Natural History Bulletin 9: 111–129.

Yang C-K, Yang D (1990) New and little-known species of Plecoptera from Guizhou Province (I).Guizhou Science 8: 1–4.

Yang C-K, Yang D (1991) New and little-known species of Plecoptera from Guizhou Province (II). Guizhou Science 9: 48–50.

Yang D, Yang C-K (1992) Plecoptera: Perlidae. In: Huang FS (Ed) Insects of Wuling Mountains area, Southwestern China. Science Press, Beijing, 62–64.

Yang D, Yang C-K (1993) New and little-known species of Plecoptera from Guizhou Province (III). Entomotaxonomia 15: 235–238.

Yang D, Yang C-K (1995a) Three new species of Plecoptera from Hainan Province. Acta Agriculture Universitatis Pekinensis 21: 223–225.

Yang D, Yang C-K (1995b) Plecoptera: Perlidae. In: Wu H (Ed) Insects of Baishanzu Mountain, Eastern China. China Forestry Publishing House, Beijing, 59–60.

Yang D, Yang C-K (1996) Four new species of Plecoptera from Nei Mongol. Journal of China Agricultural University 1: 115–118.

Yang D, Yang C-K (1998) Plecoptera: Styloperlidae, Perlidae and Leuctridae. In: Wu H (Ed) *Insects of Longwangshan*. China Forestry Publishing House, Beijing, 40–46.

Zwick P (1983) The *Neoperla* of Sumatra and Java (Indonesia) (Plecoptera: Perlidae). Spixiana 6: 167–204.

Zwick P, Sivec I (1985) Supplements to the Perlidae (Plecoptera) of Sumatra. Spixiana 8: 123–133.